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PHEROMONE COMPOSITION

The invention relates to compositions formulated to attract fish, in order to capture them. More particularly the composition may be used in a liquid form to be applied onto or into bait, lures or flies which are used by anglers and commercial fishermen alike.

Angling and fishing are sports which attract a large number of people. A wide range of bait, lures and flies are marketed at these persons in order to provide them with more success in catching fish.

Some organic compounds are known to be active in the feeding response of some species by enhancing feeding or attracting fish to a general area. They are known to occur at low concentration levels in crustacea and also in a range of decomposing animals. Such compounds are small organic odorants.

It has been reported that women have a greater success rate in catching salmon than male anglers (see Salmon and women, W. Paterson & P. Behan, published by H, F & G Witherby Ltd 1990).

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1	It is an object of the invention to provide a
2	composition showing enhanced attracting effects on
3	fish.
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5	It is another object of the invention to provide a
6	method to attract fish by using the composition of the
7	invention.
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9	It is a further object of the invention to provide the
10	composition of the invention to be applied to bait
11	(live or dead), lures or flies (dry or wet) used in the
12	practise of angling or commercial fishing.
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14	It has surprisingly been found that compositions
15	containing at least one human female pheromone presents
16	an unexpectedly good attractive effect on fish, and
17	particularly on salmon. Such compositions may be
18	applied on any kind of bait used by anglers and
19	fishermen.
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21	Herein the term "pheromone" is taken to include amines
22	such as trimethylamine and pyrroline, and salts
23	thereof, steroids of the androstene family such as 5-
24	alpha-androst-16-en-3-α-ol, heterocyclic compounds
25	including nitrogen and/or sulphur such as indole and
26	skatole and alkanoic acid compounds such as 4-
27	methyloctanoic acid.
28	
29	The objects of the invention are achieved with a fish
30	attracting composition comprising at least one human
31	female pheromone, or a synthetic nature-similar version

of the latter.

In one embodiment the invention provides at least one female human pheromone together with an acceptable carrier.



Alternatively the composition can comprise a synthetic female pheromone with a carrier. Preferably the carrier solubilises the compound.

Preferred carriers include aliphatic alcohols such as ethanol, monoethylene glycol and propylene glycol.

It is preferred that the pheromone used in the composition of the invention be at least trimethylamine or one volatile steroid of the androstene family together with at least one compound chosen from a complex array of alkanoic acids, including those having a carbon atom number ranging from C4 to C5 and especially substituted acids having a carbon atom number ranging from C8 to C10.

A particularly preferred composition comprises at least one salt of trimethylamine (typically the hydrochloride) and 5-alpha-androst-16-en-3- α -ol.

A preferred composition according to the invention may comprise in association with nature-similar versions of human female pheromones, a suite of other potent aroma chemicals (referred to herein as Key Impact Odorants [KIOs]) which occur in both fresh and decomposing animal tisue.

These other KIOs can be special amines and associated heterocyclic compounds including nitrogen and sulphur such as indole and skatole. It is also preferred that the odorant compounds be provided with concentrations of several order of magnitude higher than the ones which are found in conventional bait.

The composition of the invention can be used in various embodiments.



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1	In one embodiment the composition is a liquid which
2	bait, lure, fly, ground bait and/or hooks can be dipped
3	into or the liquid can be poured onto the bait, lure,
4	fly, ground bait and/or hooks.
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6	The composition of the invention may also be formulated
7	as a spray to allow easy manipulation by the users and
8	could either be hand pumped or gas driven.

In a preferred embodiment the composition is formulated 10 to be injected into bait. 11

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Alternatively the composition can be incorporated into plastic bait.

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To attract fish one may apply the composition of the invention on a bait or a suitable support and provide it in area where fish are used to be found.

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The composition may also be applied directly onto bare 20 hooks. 21

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The composition of the invention can be formulated for a wide range of applications including combining with floatant, spraying flies, combining with greasing or degreasing agents to enable bait to float or sink as required.

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The formulation can also be combined with ground bait and dried for storage purposes.

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Formulations of the present invention are surprisingly 32 effective in aqueous solution. Whereas a preferred 33 carrier is ethanol and a basic formulation can include 34 a salt of trimethylamine in ethanol, in use the 35 formulation produces trimethylamine on contact with 36



water. In fishing, the formulation will be vastly diluted in water and therefore it is most surprising that use of the formulation can effectively enhance fishing.

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The pheromones which may be advantageously used in a composition according to the invention include the following:

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Trimethylamine (TMA) (as derived from a salt of trimethylamine such as the hydrochloride) is an exceptionally interesting KIO pheromone. It occurs on human skin and is especially important for females. It is the characteristic odour of a menstruating female. The odour profile is distinctive and is not shared by closely related amines such as, for example, The aroma is that of fresh shell fish dimethylamine. at the threshold level. In fact it is thought that most of the charm of oyster, scallops and the like The aroma changes with increasing comes from TMA. concentration and becomes increasingly unpleasant. a high level TMA will be perceived as an off-odour in shell fish and the like, and as a sign of lack of hygiene in a human subject.

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The threshold concentration for humans is about 1ppb (1 26 part in 109) - this is low by olfactory standards. 27 There is, in fact, great individual variability and the 28 concentration varies around the mean figure by about 3 29 This gives rise to great orders of magnitude. 30 variability; for example, a crustacean may appear 31 delightful to a person of high threshold but may be 32 abhorrent to a person of low threshold (skin 33 sensitivity). See in that matter "Ageing and the Sense 34 of Smell" C, Van Toller, GH Dodd & A Billing, Charles T 35 Thomas, Publisher, Springfield, Illinois, USA, 1985. 36

Another interesting pheromone to be used in the fish-attracting composition is 1-Pyrroline. This is a rare and little studied human pheromone. It is unstable and therefore very difficult to study. It is formed by oxidation of precursor molecules such as 1,4-diaminobutane and 1,4-diaminopentane. These amines occur in a variety of human tissues, and can be formed from appropriate amino acids.

In order to overcome the instability problem when 1Pyrroline is to be used in a fish-attracting
composition of the invention, the parent amines (i.e.
the above mentioned precursors) are incorporated at a
high level in the composition. They will slowly
oxidize and release the unstable active odorant.

These parent amines are also called respectively, putrescine and cadaverine, for obvious olfactory reasons and occurred in decomposing animal tissue. The human threshold is in the ppb range.

A further preferred pheromone is the 5-alpha-androst- $16\text{-en-}3\text{-}\alpha\text{-ol.}$ This pheromone is a well-known pheromone which is found in both males and females but is thought to be more important for women (in contrast to the related steroid pheromone, alpha-androstenone). The threshold for human is in the low ppb range. The odour is usually described as musky.

A still further preferred pheromone is 4-Methyloctanoic acid which is characteristic of the scalp odour and may be found in gamey meat. The threshold is unusually low for a fatty acid and is in the region of ppb. It is has been reported that women are much more sensitive to this odorant than men.





Amount Required for

A particular composition according to the invention has
been tested in fishing experiments on the River Ness,
other rivers in the Highlands, and in Ireland and on a
variety of Lochs. Positive results have been obtained

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> The composition of this particular non-limiting composition is the following:

> > Name

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Component No

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,	Component in		_		
10		1000 litres of			
11		solvent	(ethanol)		
12					
13	1	Trimethylamine	7kg		
14		hydrochloride			
15	2	1,4 diaminobutane	0.7kg		
16	3	1,4 diaminopentane	0.1kg		
17	4	indole	50 grm		
18	5	skatole	40 grm		
19	6	isovaleric acid	40 grm		
20	7	4-methyloctanoic acid	10 grm		
21	8	4-methylnonanoic acid	5 grm		
22	9	phenylacetic acid	20 grm		
23	10	2-methyl-E-butenoic acid	5 grm		
24	11	4-methylpentanoic acid	10 grm		
25	12	2-methyl-2-pentenoic acid	10 grm		

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A more general preferred composition comprises 28

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30	Component No	Name	Amount Required for
31			1000 litres of
32			solvent
33			
34	1	KIO Pheromone	0.05-50kg
35	2	Alkanoic acid	5g-1.5kg
36	3	Amines	0.1kg-8kg

5-alpha-androst-16-en-3- α -ol 60 mg-6g



Even if a special emphasis has been given on the 1 utility of the composition in order to ease fishing it 2 is understood that the composition to attract fish as 3 above described may be used for other purposes. 4 example it may be used to attract salmon into special 5 paths provided in order to help them to cross dams, 6 waterfalls or other obstructions. 7

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Experimental Study

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An initial study was carried out to establish a relationship between the use of female pheremones at a chosen concentration and the increase in the catch of salmon, either by fish size or numbers caught using the conventional rod and line method with a selected range of hand tied salmon flies.

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Three specialist salmon fly fishermen were chosen who regularly fished prime salmon rivers, have extensive combined specialist knowledge gained from 20 years of fly fishing, fish a regular pattern over the entire season, have experience of observing changes and variations in fish runs and catch methods and were willing to comply with strict rules with regard to reporting procedures.

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Rivers chosen for the study covered the entire salmon 27 cycle, i.e Spring-Summer and Autumn salmon runs, 28 January-September 1997. 29

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Results

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Some interesting findings came to light at the season 33 34 end:

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Of the three subjects chosen, all had a significant 1 change in their catch pattern, (1) 43 salmon caught (2) 2 75 salmon caught (3) 15 salmon caught. 3 4 Subjects (1) and (2) fly fished the middle/upper 5 reaches of a major salmon river. The river is world 6 famous for the range of salmon fishing available. 7 Spring salmon run (10-25lbs) is moderate. Large runs 8 of Summer grilse (3-8 lbs) and a good run of Autumn 9 salmon (10-30 lbs). 10 11 Subject (3) fly fished a major East Coast spring salmon 12 fishery (10-30 lbs) This river has small runs of summer 13 salmon owing to licensed commercial fishing in estuary 14 15 waters. 16 In all cases the reports returned were similar with 17 more consistent catches particulary when fish were in 18 holding pools (when water levels receded after floods). 19 20 Catch summary (Salmon caught) 21 22

23	Subject	1996	1997
24	(1)	37	75
25	(2)	18	43
26	(3)	9	15

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No exceptional fish size was reported over that of the 1996 season.

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Water levels for 1997 were consistently high by 31 comparison to 1996 resulting in concentration of 32 several salmon runs in holding pools throughout the 33 entire river system. 34

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Current information on official commercial salmon catch



1	ventures	for	1997	would	indicate	a	20%	reduction	on	the
2	1996 seas	son.								

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Water temperatures were slightly higher than previous 4 5 years.

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Most salmon for this study were caught on an imitation 7 shrimp fly dressing of various sizes. 8

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All subjects chosen for this study were male with 10 average age of 45 years. 11

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All subjects chosen tie their own flies, however, similar selected shrimp/prawn flies were distributed to all.

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Salmon flies used were purchased from local fishing tackle shops.

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The final results of this initial trial study would indicate some relationship between the choice of fly with sample female pheromone and the traditional fly fishing method.

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One fisherman has fished for Sea Bass (commonly known 25 as Salmon Bass) off the east coast for many years, with 26 varying success. This specialist fishing activity • 27 fished off chosen rocky points in July/August would 28 normally yield 1-2 fish per outing. This year, using 29 identical fishing lures, substantially improved bass 30 catches were recorded with better than average sizes 31 using the female pheromone formulation described 32 herein. Other specialist bass anglers fishing the same 33 waters did not use the formulation and did not return 34 above average catches.